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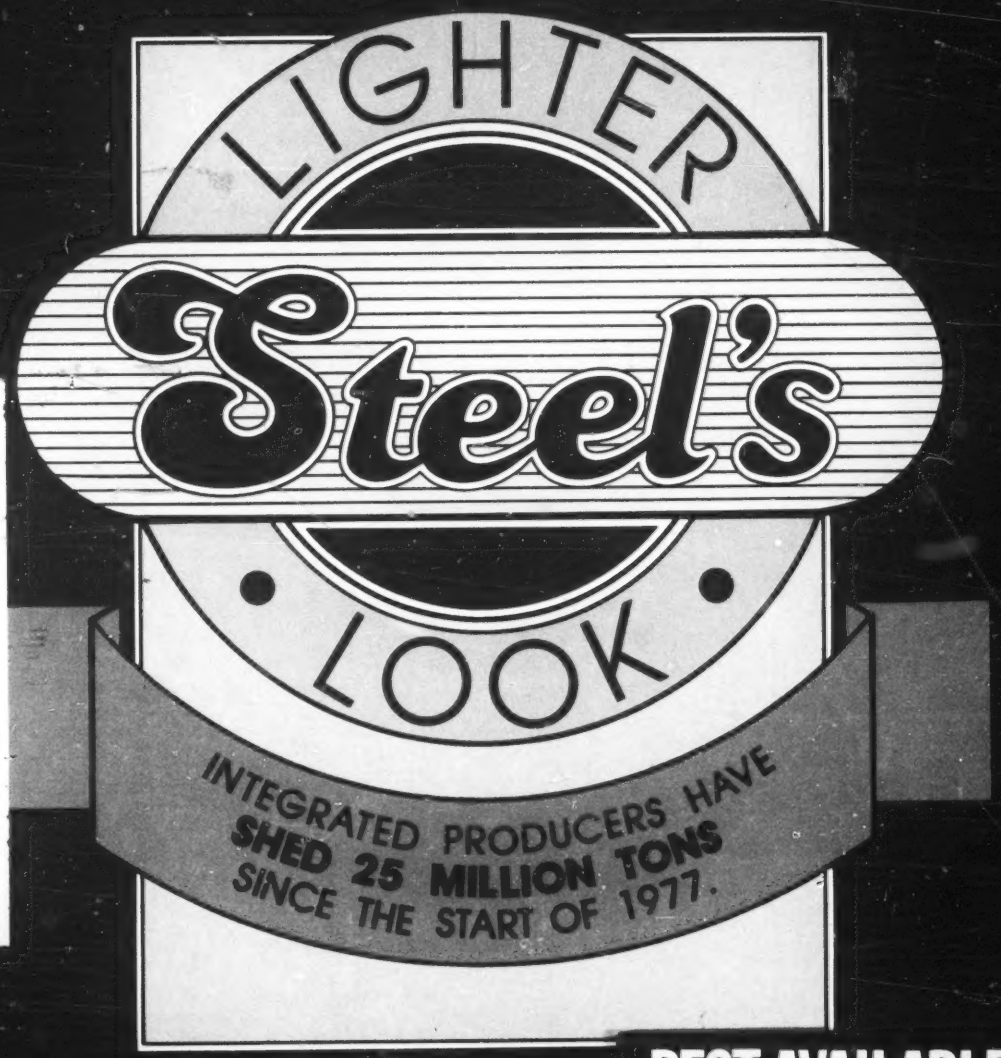

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VOL. 226, NO. 23

IRON AGE

SEPTEMBER 5, 1983

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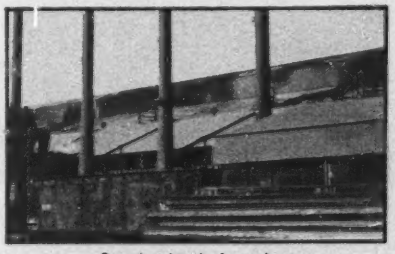

Smokestack America.

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COMMERCE SEES GROWTH IN SPECIALTY STEEL IN DECADE AHEAD

Prospects for overall demand remain dim. Growth rates will remain at no more than 1 to 1.2 pct. per year-the same rate as the 1970s.

BY EDWIN W. BOWERS

Everyone knows, as the U.S. government says "steel is clearly essential to national security and economic well being." And everyone it seems is seeking the answer to the question: What lies ahead for the domestic steel industry?

A U.S. Commerce Department task force has assessed prospects for the industry including the outlook for its critical raw materials. Demand for steel in the '80s, the panel says, will increase by no more than 1 to 1.2 pct. per year—the same growth rate as the 1970s. At the same time steel shipments are predicted to range from lows of 90 million to 94 million tons, to as high as 104 million to 108 million tons.

Also, the 12-member group forecasts a trend in steel production toward specialty or alloy steels. In addition, although the panel sees the industry's increasing dependence on foreigners for alloying raw materials, it does not see the U.S. vulnerable to supply disruptions across-the-board. "The vulnerability of the industry to disruptions in supply of alloying materials varies with commodity," the group concludes. The study looks critically at nickel, chromium, manganese, tungsten, molybdenum, and silicon.

It says the U.S. is considered vulnerable to a disruption in manganese supplies but not so, for example, in the case of molybdenum. Supplies of chromium, it says, "are expected to be at the most serious risk because of high import dependence, potentially unstable supply sources, questionable stockpile inventories and lack of cost effective substitutes." Although the U.S. will continue to import 70 pct or more of its primary nickel supplies, Commerce says, they should be readily available from a diversity of exporting countries. Also readily available will be tungsten concentrates, according to the survey, although "import dependence is expected to continue and, perhaps, increase through 1990."

The evaluation continues: "domestic ferrosilicon production capacity should remain at adequate levels to meet essential U.S. needs in an emergency."

"We consider this assessment of the various industries useful," says George Watson, President, the Ferroalloys Association, "but flawed. The government sees import supplies in terms of accessibility in the event of an international crisis and not in terms of how much imports are affecting our domestic industries. We disagree with their conclusions on the silicon business: that it is stable and it is going to be healthy—it is not. It's being beat to hell by imports.

"The level of domestic steel output is also influenced by its cost competitiveness with foreign producers," says Ralph Thompson, of Commerce's Bureau of Industrial Economics (BIE). "Determinants of international competitiveness include labor costs and productivity, energy efficiency, capacity use, regulatory and materials costs. While the U.S. steel industry is generally competitive in energy and materials costs and use, it is less competitive in terms of labor costs and productivity vis-a-vis foreign producers."

Obviously how the steel industry grows will be among the major factors governing requirements for ferroalloys and other alloying metals.

"The production of alloy steel, including high-strength, low-alloy (HSLA)," the government says, "is projected as increasing from 11 pct of total shipments in 1980 to about 13 pct in 1990. Stainless steel is also expected to increase its share of steel output, from 1.3 pct. in 1980 to 1.6 pct. in 1990. The tool steel share of total steel shipments should remain at about the same level throughout the decade. As a per-

STEEL INDUSTRY FERROALLOY REQUIREMENTS (BASE CASE)

(thousands of tons)

	1980	1982	PROJECTED 1986	1990
Ferrochromium	227,996	163,140	244,711	255,587
Ferromanganese	766,266	548,295	822,443	858,996
Silicomanganese	139,790	100,025	150,038	156,707
Ferrosilicon	268,684	192,255	288,382	301,199
Ferrotungsten	226	162	243	253
Ferronickel	27,872	19,950	29,925	31,255
Ferrocolumbium	2,295	1,642	2,463	2,573
Ferrovanadium	5,217	3,733	5,599	5,848
Ferromolybdenum	2,141	1,532	2,298	2,400
(HIGH CASE)				
Ferrochromium	227,996	163,140	282,777	293,653
Ferromanganese	766,266	548,295	950,378	986,931
Silicomanganese	139,790	100,025	173,378	180,046
Ferrosilicon	268,684	192,255	333,241	346,058
Ferrotungsten	226	162	280	290
Ferronickel	27,872	19,950	34,569	35,910
Ferrocolumbium	2,295	1,642	2,846	2,956
Ferrovanadium	5,217	3,733	6,470	6,719
Ferromolybdenum	2,141	1,532	2,655	2,758

Source: U.S. Commerce Dept.

cent of steel shipments, carbon steel is expected to decline from 87 pct. in 1980 to about 85 pct. by 1990.

More than 90 pct. of the U.S. consumption of manganese goes into steel. The U.S. depends on imports for almost all of its manganese ore and about 77 pct. of its ferromanganese requirements. It is import dependent for an even higher percentage of its high carbon ferromanganese. The Commerce group sees consumption going up by only 0.4 pct. between now and 1990, a general decline in unit usage. "It seems reasonable to predict that manganese usage per ton of steel will decline by about 4 pct by 1986 and 7 pct by 1990." This is the result, they say, of lower carbon steel production and increased use of external desulfurization and continuous casting. The Ferroalloys Association disagrees. "We just don't think that's realistic," says Mr. Watson.

In Commerce's low-case projection, steel industry demand for primary chromium is projected to 256,000 tons by 1990. Ferrochromium requirements are put at 294,000 tons in seven years. Stainless and heat resisting steels should make up 1.5 pct. of total steel shipments by 1986 and about 1.6 pct. by 1990.

Indications are that world reserves of chromite are quite large in comparison to current rates of use. And there are enormous quantities of resources available for future development. Supplies should be sufficient to meet demand well into the next century, the Commerce group says. Since mining capacity is currently about 13 million short tons per year, well above present world mine output, adequate capacity would seem to be assured over the next five to 10 years, they conclude. (Cont. on p. 33)

STEEL INDUSTRY SHIPMENTS (BASE CASE)

(thousands of tons)

			PROJECTED	
	1980	1982	1986	1990
Semifinished	5,342	3,408	5,040	5,295
Rods, Bar, & Wire	17,714	10,772	17,371	18,076
Flat Rolled	39,304	32,236	46,711	48,607
Pipe and Tube	9,097	5,026	8,190	8,523
All Other	12,396	8,341	12,688	13,499
Total	83,853	59,783	90,000	94,000
	(HIGH CASE)			
Semifinished	5,342	3,408	5,827	6,064
Rods, Bar, & Wire	17,714	10,772	20,084	20,900
Flat Rolled	39,304	32,236	54,007	56,200
Pipe and Tube	9,097	5,026	9,469	9,853
All Other	12,396	8,341	14,613	14,983
Total	83,853	59,783	104,000	108,000

Source: U.S. Commerce Dept.

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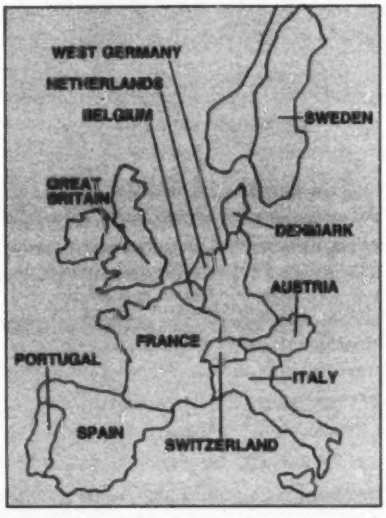

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But, Commerce says, the increasing reliance of the major industrial nations, including the U.S., on imported ferrochromium may result in decreased flexibility and increased vulnerability of supply on the part of steel producers.

The world's largest consumer of processed nickel—the U.S.—has very little processing capacity of its own and, according to BIEs Graylin Presbury, "is dependent on imports for its supply of processed nickel." The Hanna Mining Co. produces some ferronickel as does AMAX; the latter firm uses imported raw materials. U.S. nickel reserves are rated "small" at 360,000 tons of ore containing between 3,000 and 5,000 tons of nickel. World nickel reserves are conservatively estimated at 60 million tons of ore. The U.S. consumes annually about 23 pct of the world's output.

According to Commerce, steel industry demand for primary nickel is expected to increase at the same growth rate as overall steel output. The production of stainless and heat-resisting steels is expected to be about 1.6 pct. of overall steel output by 1990. Demand for nickel in superalloys will probably be the fastest growing application for nickel and overall nickel demand is expected to increase 2.2 pct. per year through 1990. This comes out—on the low side—to an average annual increase of about 530 tons, reaching 49,100 tons in seven years. Ferronickel requirements under those conditions would be about 31,000 tons in 1990, an average annual increase of 340 tons.

Should steel industry shipments range more to the high side estimate averaging a 2.6 pct. annual increase, nickel consumption could go as high as 56,400 tons by 1990. Ferronickel use would jump to 35,900 tons averaging about 800 tons annually.

"Future prospects for adequate supplies of nickel are bright since enormous nickel reserves have been identified around the world," says Commerce's Robert Wilson, chairman of the task force.

America's northern neighbor is included among America's leading sources of ferrosilicon products along with Iceland, Norway and Brazil. But Mr. Watson says the domestic industry is "hanging on by its teeth as Canada, Venezuela, Brazil and Iceland gear up to invade the U.S. market."

The Commerce Department says "while U.S. production capacity for silicon metal is expected to increase over the next decade, production capacity for ferrosilicon may decline owing to increased power costs, decreased production of other ferroalloys and import competition." Says Mr. Wilson: "More furnaces may be shut down if the import competition continues at the present price differentials." Nevertheless, the government panel says "domestic ferrosilicon production capacity should remain at adequate levels to meet essential U.S. needs in an emergency."

It is known that deposits of silicon-bearing raw materials are widespread throughout the U.S. and the world. Deposits are more than sufficient to sustain the ferrosilicon and silicon metals industry indefinitely at current production rates, says the U.S. Bureau of Mines.

About 37 pct. of U.S. consumption of silicon goes for steel. Commerce says requirements are expected to increase at an annual rate of 3 pct. as increased alloy steel production, use of continuous casting and other factors lead to greater demand for the alloy. In the study group's base case, overall steel industry requirements for silicon increase from 193,000 tons in 1982 to 303,000 tons in 1990 and in its high case—based on higher levels of steel production—silicon requirements increase to 348,000 tons in 1990.

Paradoxically, Commerce says U.S.

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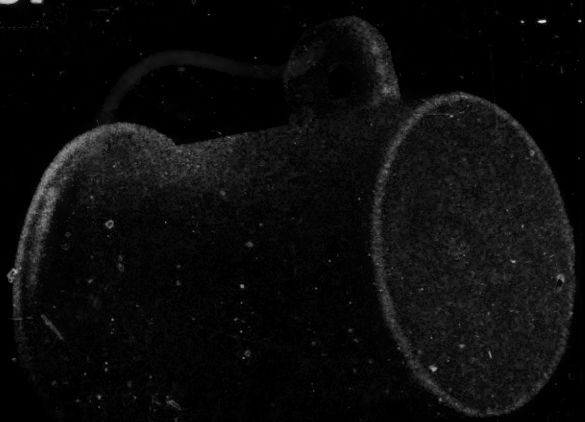

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production capacity for silicon metal is expected to increase over the next decade yet it might decline for ferrosilicon because of increased power costs, import competition and decreased production of other ferroalloys. Nevertheless, it says, domestic ferrosilicon production capacity should remain at adequate levels to meet an emergency.

Supplies of tungsten concentrates—although the U.S. is totally dependent on imports—should also be sufficient to 1990, says James Kennedy. "There has been a slight downward trend in the amount of tungsten consumed per ton of tool steel shipped," he observes.

In Commerce's "base case" projection, U.S. requirements for tungsten three years hence are projected to be 783 tons compared with 729 tons three years ago. The figure is expected to rise to 817 tons in 1990, an average annual increase of nine tons. Based on higher levels of steel production over the years, U.S. tungsten needs could be as high as 904 tons in 1986 progressing to 938 tons three years later.

Although the U.S. has the world's largest tungsten processing industry, domestic production is insufficient to meet demand for tungsten concentrates, says Mr. Kennedy. Currently the U.S. imports about 54 pct. of its consumption of tungsten concentrates. Thus, import dependence is expected to continue and, possibly, increase through this decade.

Right now stockpile levels of chromium, and nickel, among others, are below governmentally established goals. There is no stockpile goal for ferrosilicon and stocks of tungsten and manganese are above the government's goals.

"The United States is the only country incapable of meeting its domestic steel needs with domestic production," says Rep. Joseph Gaydos (D., Pa.) a member of the Congressional Steel Caucus. "Between 1977 and 1981 the U.S. lost 12.5 million tons of steelmaking capacity and may wind up losing at least that much again between now and several years hence. Once you lose capacity it is gone forever. It is too difficult to get back."

Rep. Nick Rahall (D. WVa.) cites the book, "World Steel in 1980," written by Fr. William I. Hogan in which Rev. Hogan says "this country is the objective of virtually every steel producing country in the world. It is open where others are not. They design their steel capacity with exports to this country in mind."

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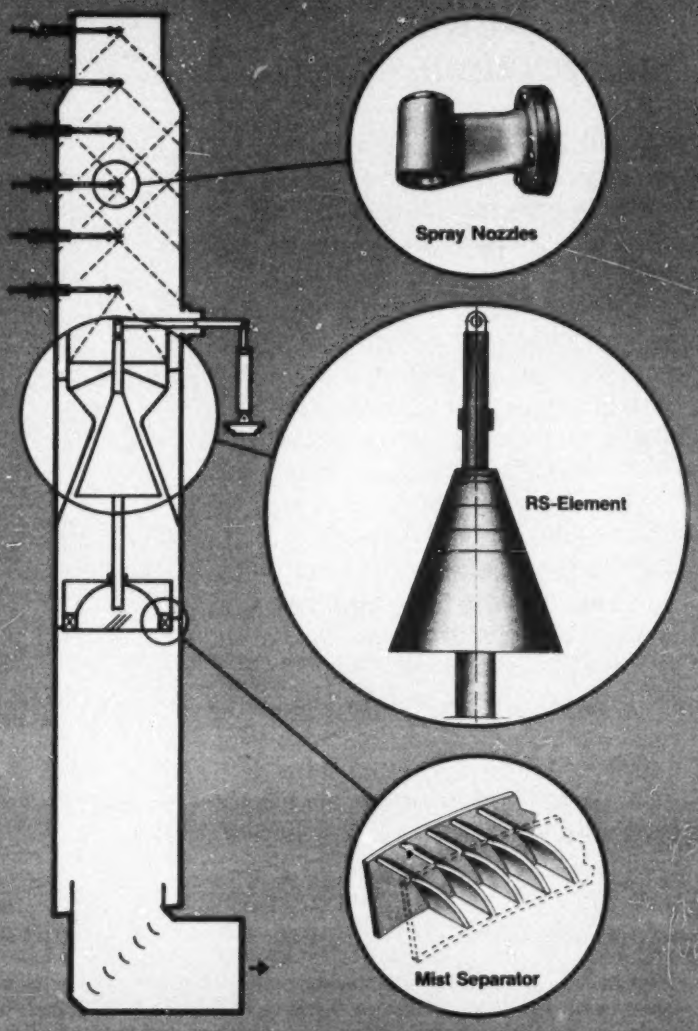

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METALWORKING ORDER TRENDS

Prices continue to play a cool, cool tune

Producer prices in July went from cool to cooler. Prices for finished goods rose 0.1 pct from June levels. This increase was smaller than those of 0.3 pct in May and 0.5 pct in June.

Most of the price slowdown was due to a sharp easing off in energy prices. In July, energy prices rose a slim 0.2 pct following much larger advances in May and June.

Finished goods prices for the 12-month period since last July were up 1.4 pct. In May, this annual rate came to 2.3 pct, and in June it was 1.8 pct.

Notably, going right along with the price cooling in finished goods, capital equipment tags also came down in their rate of advance. In July, capital equipment prices rose 0.1 pct compared to increases of twice that in May and June.

The average price advance in July for the key 22 metalworking products listed on the table here was a bit less than 0.9 pct.

If sustained over a year's time, the annual rate increase for the metalworking lines would come to 2.2 pct.

It could well be that producer prices will be soon firming up prior to a possibly mild upturn in the early fall. This is likely because the economy spurted so strongly in the second quarter (real GNP up 9.2 pct).

Too, consumers have been buying big-tag items like cars and appliances at a fast clip. Consumers took on more installment credit in June than for any month since the government began keeping track in 1943.

Predictably, this demand-side pressure will catch up with producer prices before long. The delay fuse on a price blowup has been the great slack that remains in the economy following the severe 1981-82 recession.

A scan of the table here shows that cool prices prevail across the spectrum of metalworking products. The only unusual rise was in electric motors. That rise was due in part to the U.S. Labor Department's inclusion of generators and generator sets with engines in July for the first time.

A firming of prices in the months ahead is a good omen, not a bad one, for metalworking. After all, firming prices would mean the business recovery was continuing on course.

Notably, prices in the general economy rose from 3.4 pct to 4.4 pct in the second quarter. But GNP still went from a 2.6 pct annual rise rate to a 9.2 pct rate.

Latest Month Covered: July, 1983

Products	Index Reading For Month (1967 = 100)	Pct Change From Previous Month	Pct Change From Year-Ago Month
Metal Cutting Machine Tools	377.0	− 0.3	+ 2.0
Metal Forming Machine Tools	416.2	+ 0.1	+ 1.3
Agricultural Machinery & Equip.	326.2	+ 0.2	+ 4.9
Construction Machinery & Equip.	352.7	+ 0.1	+ 1.9
Industrial Process Furnace & Ovens	361.7	+ 0.1	+ 2.0
Industrial Material Handling Equip.	284.8	− 0.1	− 0.7
Pumps, Compressors & Allied Equip.	347.7	+ 0.1	0
Fluid Power Equip. (Dec. 1970 = 100)	253.5	0	+ 3.1
Mechanical Power Transmission Equip.	315.0	− 0.2	− 0.1
Automobiles	217.5	0	+ 1.8
Motor Trucks—Light	269.5	− 0.3	+ 0.9
Motor Trucks—Heavy	313.5	+ 0.2	NA
Railroad Equipment	358.1	+ 0.4	+ 4.5
Fabricated Metal Structural Products	302.2	+ 0.1	− 0.6
Electric Motors	330.7	+ 2.6	+ 7.6
Valves (Metal, Ex-Fluid Power—Dec. 1982=100)	99.9	− 0.3	NA
Ball & Roller Bearings	330.9	+ 0.1	− 0.9
Cutting Tools & Accessories	275.4	− 0.3	+ 0.8
Heating Equipment	244.0	+ 0.6	+ 2.1
Plumbing Fixtures & Brass Fittings	292.1	+ 0.5	+ 3.1
Metal Containers	337.4	+ 0.2	+ 2.2
Miscellaneous Metal Products	287.4	0	+ 1.5

Data based on U.S. Labor Dept.'s Producer Price Index

50 PCT OF TODAY'S CAR IS STEEL.

TOMORROW?

Aluminum and plastics are posing a challenge. Pontiac's Fiero and Dodge's Mini Ram Van use material which could loosen steel's grip.

BY BRYAN H. BERRY

Three new vehicles are breakthroughs in automotive aluminum, plastic and steel. The 1984 Chevrolet Corvette uses weight—saving aluminum forgings and castings for diverse structural parts that usually are iron or steel. The 1984 Pontiac Fiero, which debuts next week, proves that plastic can match the surface appearance of steel. The 1984 Dodge Mini Ram Van due this winter uses 1½-side galvanized steel for all exterior panels except the roof; it should resist corrosion for ten years.

The fledgling plastics industry is cutting the cycle time, thickness, and cost of the sheet-molding compound (SMC) and reinforced reaction-injection-molded (RRIM) compounds used on the automotive body skin. The entrenched steel industry continues to lose exterior body panels to plastics but still accounts for 55 to 60 pct of the dry weight of the average vehicle. The aluminum industry is proving more successful at capturing structural parts inside the car than body panels outside. The bumper, however, is providing good business for all three industries.

"Whenever a car design calls for hang-on body panels that don't provide the structural integrity," says Stuart P. Keeler, staff applications specialist, product applications center, National Steel Group, "all the sheet steel used for the automotive skin is vulnerable to plastics."

Both the Corvette and the Fiero use plastic body panels fixed to a steel structural frame, or "birdcage." How widely will this concept be used? How do the plastics, steel and aluminum used on exterior body panels compare in manufacturing and cost? How are the makers of these materials improving them to suit the car better?

"If you're talking strictly economics and forgetting everything else," says James K. Reinker, manager, advanced automotive development, chemicals/plastics/industrial products group, General Tire and Rubber Co., "your first choice is going to be steel. No ifs, ands, or buts about that."

The raw material cost of plain carbon steel is 30 or 40¢ per pound. Coated steels cost more.

Both aluminum and plastics cost $1 or more per pound. A primed, processed SMC component on a car assembly costs $1.75 or $2 per pound, estimates Mr. Reinker.

Area is a better measure of cost. Here steel has the lowest cost per square foot, says William J. Riffe, coordinator, high-strength steel sheets, U.S. Steel Corp. "Plastics are five to seven times more expensive than steel," says Julius J. Harwood, director, material sciences laboratory, Ford engineering and research staff. "Steel costs 25¢ per lb. Plastics and aluminum cost $1.30 or $1.40."

"Plastic competed head-to-head with aluminum," says Mr. Reinker, "for GM's Z28 hood. GM selected SMC over aluminum strictly on the basis of cost."

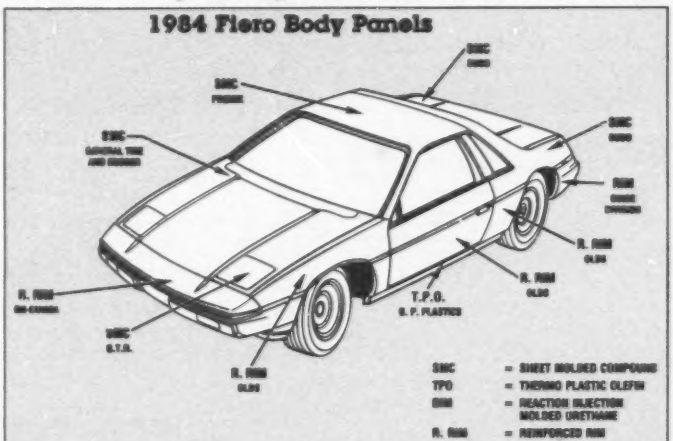
"Today's automotive market," emphasizes Mr. Harwood of Ford, "is very conscious of cost. Whatever benefits any material gives, it can't impose a cost penalty on us. I don't see how we can compete any better with the Japanese by putting aluminum on our exterior panels."

Aluminum's not *that* expensive, protests Arthur S. Kasper, automotive technical director, Reynolds Metals. Wrought aluminum sheet costs 1.9 times more than steel, he says; 1.5 times more than galvanized steel; and 1.3 times more if you consider that aluminum weighs less than steel and can be recycled completely.

"Aluminum almost always gives automakers the lowest weight component," says Michael J. Wheeler, automotive product development manager, sheet plate division, Alcan Aluminum.

Engineers from the aluminum, steel, and plastics industries competed to design the lightest-weight decklid at a passenger-car meeting sponsored by the Society of Automotive Engineers (SAE) two years ago. The winner was aluminum at 12.3 lbs, followed by SMC at 16 lbs and steel at 24.5 lbs.

SMC tooling is much less expensive than metal tooling but can produce fewer parts. Steel tooling costs two or three

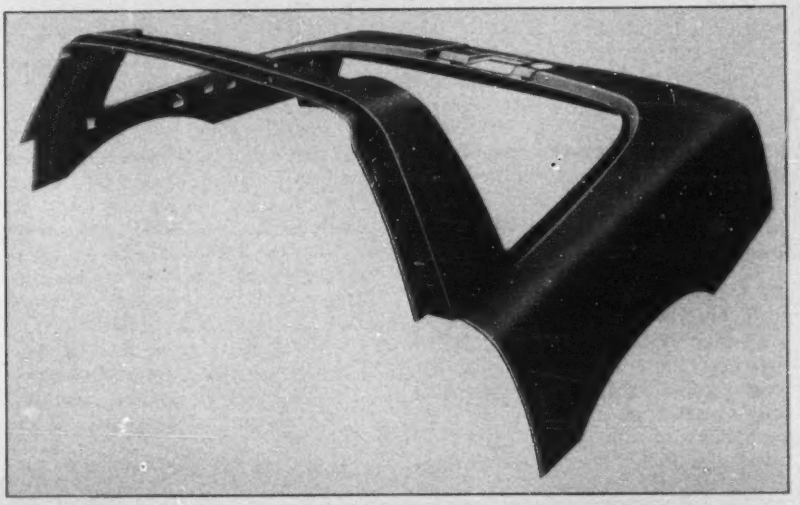


"Pontiac's sporty two-seater uses plastic body panels bolted to a steel "space frame." Source: Pontiac

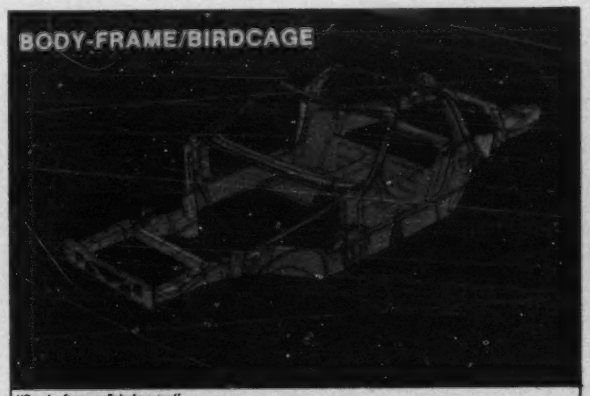
It's not that simple, says David B. Reed, materials engineering, Pontiac: "People who say that a plastic hood has twice the cost of a steel hood, are comparing the cost of steel stamped within the car company to the cost of a plastic hood bought from an outside supplier.

"Ford found that a plastic hood molded at Ford cost quite a bit less than a steel hood stamped by an outside supplier."

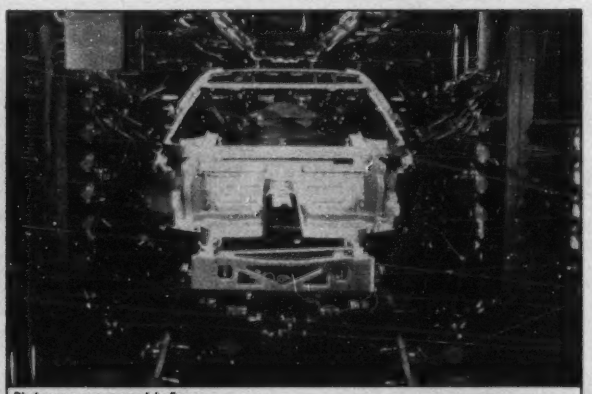
THE CORVETTE PRODUCTION PROCESS



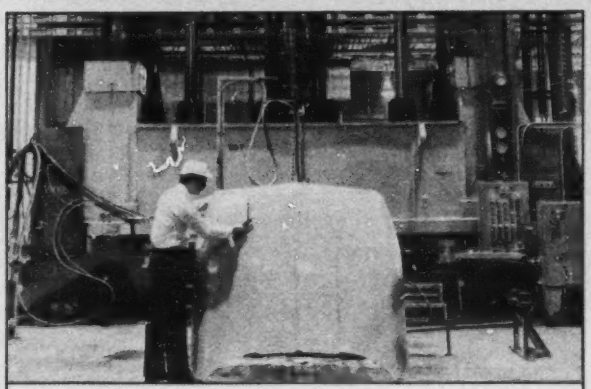
Rear roof assembly for Corvette: Plastic excels at consolidating several metals parts. Here four separate fiberglass reinforced plastic components form the rear roof of the 1984 Corvette.
Source: General Tire & Rubber Co.



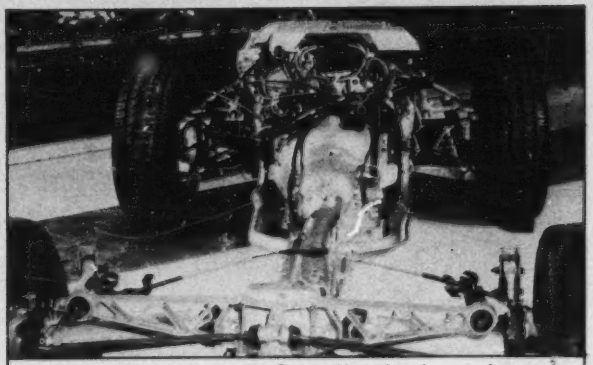
"Body-frame/birdcage"



Birdcage on assembly line



Huge press with plastic hood



"Aluminum industry calls Corvette aluminum story of 1984."

The 1984 Corvette has a plastic body skin over a metal frame, or "birdcage." The birdcage (top left) is made mainly of National Steel's galvanized steel but also of aluminum and aluminized steel. General Tire and Rubber makes the fiberglass-reinforced plastic outer hood panel with a hige press (bottom left) that can exert molding pressures of 2,500 tons. The Corvette also uses lot of forged and cast aluminum (bottom right) including forged aluminum front knuckles and upper and lower control arms, trailing arms, lateral struts, driveline channel beam and wheel drive shafts.

times more than SMC tooling, estimates Mr. Reed of Pontiac. Tooling for the inner and outer panel of a hood made of steel would cost about $3 million, he estimates; SMC, $750,000.

SMC tooling has a shorter lifetime than tooling for steel, however. SMC tooling might produce 100,000 panels, says Mr. Reinker of General Tire, "and that's stretching it."

Also, making SMC panels takes more time than do steel panels. The cycle time for the average SMC panel, estimates Mr. Reinker, is three minutes button-to-button. Cycle time on a steel stamping line, in contrast, can be about six seconds: 600 parts an hour.

One big advantage of SMC: Several metal panels can be consolidated into one SMC panel. However slow, one single-station SMC mold will turn out a finished piece that replaces several metal pieces that each required a line of tools to make.

"Plastic gives you the versatility," says Tom J. Kalush, Fiero engineering center, Pontiac, "to change the design of your product. It gives your product a newness, a freshness that metal doesn't have.

"You can mold complex shapes from plastic that would be horrendously expensive to stamp or form from metal. One example is the rear-quarter upper surround that enclosed the Fiero's back window.

"Also you can mold in electrical fittings, so that they're encapsulated in the part."

General Motors' Fisher Body, for example, replaced eight or nine metal pieces with a two-piece SMC part for the tailgate of some GM B cars. That saved 10 or 15 lbs. The liftgate of Ford's Bronco II is SMC.

Today's Chevrolet Celebrity uses SMC rear-end panels that consolidated several metal pieces. So will GM's future C and N cars.

The lower cost of SMC tooling makes SMC particularly attractive for vehicles produced in volumes of 100,000 per year or less. Automakers also can spin off variations of high-volume models by substituting SMC panels. An SMC hood sets apart the sporty Chevrolet Citation X11 from the rest of the X cars. The Camaro's hood is SMC.

"I expect plastic to be most successful in the short-run, innovative models," says Peter F. Connor, manager, product and market development, Inland Steel.

"The American auto market is getting fragmented," says Pontiac's Mr. Kalush. "Consumers are looking for specialized cars more suited to their particular needs. The downsized Blazer and also the mini vans are good examples. The convertible is coming back. We will see more name plates and smaller volumes per nameplate.

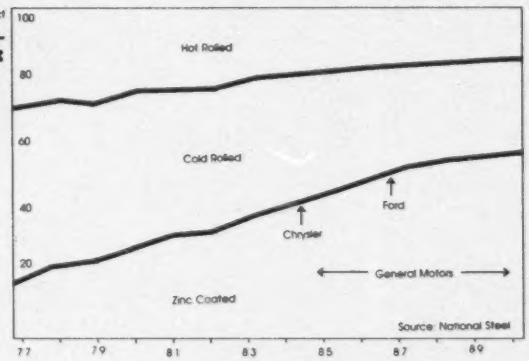
"Lower volumes open up more opportunities for automotive plastics."

Some engineers insist that SMC bodies can be economical at volumes above 100,000. GM, for example, made 200,000 SMC hoods for the Z28. Pontiac plans 80,000 to 100,000 Fieros the first year of production; but that could increase to more than 150,000 the second year.

"We could use two different sets of tools for the Fiero," says Mr. Reed of

(Cont. on p. 89)

STEEL PRODUCT MIX—MAJOR VEHICLE ASSEMBLERS



Average Material Costs for Major Automotive Materials

Material	Cost/Lb
Mild Steel*	$0.25
High Strength Steels*	$0.30
Cast Iron	$0.15
Plastics	$0.75
Wrought Aluminum	$1.15
Cast Aluminum	$0.90

*Not galvanized or treated with anti-corrosion coatings.
Source: Cochran and McClure, Aluminum Company of America

Projected Materials Usage in 1985

	Mild Steel	HSLA Steel	Aluminum	Fiber-reinforced Plastics or Composites	Non-reinforced Plastics
Hood—					
outer	50%	10%	10%	5%	0%
inner	50	15	10	5	0
Roof	90	0	0	0	0
Doors	50	20	0	0	0
Seat frame	30	30	5	2	0
Wheels	40	30	19	0	0
Gas tank	80	0	0	0	0
Bumper—					
fascia	5	20	20	0	20
support	10	50	15	0	0
Fenders	70	0	0	5	0
Suspension—					
springs	0	80	0	5	0
control arms	35	60	0	0	0
Radiator support	40	10	0	10	0
Floor pan	89	0	0	0	0
Cylinder head cover	70	0	10	5	0

Source: University of Michigan Delphi Forecast

Pontiac, "and build two different models with different skins. We'd still pay less than for one set of steel tooling."

Top priority for SMC custom molders is to reduce cycle times.

"We are learning how to reduce that three-minute cycle time," says Herbert A. Jahnle, manager, materials and environmental technology, Budd Co. Technical Center. "Already it's possible to mold an SMC decklid in 90 seconds. Sixty seconds is within reach. If we get to 60 seconds, we'll knock the hell out of steels.

"Also, we are cutting the cost of SMC panels by reducing their thickness. Standard SMC panels used to be ⅛ in. thick; now they're 1/10 in. thick.

"As we reduce panel thickness, cycle time, and cost, SMC will become competitive at higher volumes: 300,000 in a few years, I predict.

"We're a young industry. We're developing new techniques every day. Soon you'll see SMC not just on sporty cars but on family cars as well."

Two techniques developed in the past few years have improved dramatically the surface appearance of SMC.

In-mold coating, or molded-in coating, eliminates the pits and porosity that used to plaque plastics. SMC custom molders impregnate the SMC with urethane polyester while the panel is still in the tool. This adds 30 seconds to the cycle time of the SMC panel: Both the panel and the urethane coating must be cured.

The glass, polyester, and calcium carbonate used to make SMC all cool and shrink inside the mold at different rates. That can cause rippling. The new elastomeric modifier system, however, makes these materials shrink very little and even expand slightly to assume a more uniform final shape.

"We're satisfied with the surface appearance of our SMC and reinforced RIM," says Mr. Reed of Pontiac. "Even though our sheet-metal people still feel they have an edge, I can't see any difference between the steel or SMC finish.

"Fisher Body had several hundred employees inspect a dozen SMC and steel station-wagon tailgates under bright lighting. The employees actually preferred plastic."

"The difficulty comes," says Mr. Riffe of U.S. Steel, "when you put plastic, aluminum, and steel panels all on the same car body. Then even the unpracticed eye can see the difference in finish."

To improve corrosion resistance, automakers now are using an electrocoating ("E-coat" or "ELPO") system of painting that requires temperatures above 400°F. That's a tough challenge for SMC.

Chrysler's 1984 Mini-Ram Van pioneers new applications of galvanized steel. Chrysler has pioneered the use of 1½-side galvanized steel.

"Virtually no thermoplastics can survive that," says Mr. Reinker of General Tire. "Only the best thermosets can survive. It's critical that the temperature be raised gradually. If you put SMC into 400°F with no transition, the heat will cause blistering in the substrate.

"These paint ovens make our life more difficult, but we can deal with them. The Z28 hood and Bronco II liftgate run through these temperatures with minimal problems."

Paint is deposited electrostatically onto the Fiero's plastic body panels at 250°F. To prevent any warping, the panels are mounted on frames before they enter the paint oven.

"The paintability of the Fiero's RRIM panels," says Mr. Reed of Pontiac, "is better than steel's. The paint adheres better. The paint performance of our SMC panels is about as good as steel's."

SMC panels are repaired by an epoxy adhesive and polyester body-filler. "Tests so far," says Mr. Reed, "show that SMC panels cost less to repair than steel."

Dentability? "Plastics are the best," says Mr. Jahnle of Budd. "Steel's second best, and aluminum's the poorest performer."

Some speak darkly of plastic's degradation and even sagging in the hot sun. Not true, says the plastics people.

Plastics don't corrode. Aluminum also resists corrosion. Recent tests show that even unpainted aluminum doesn't corrode.

The paintability and surface appearance of aluminum is comparable to steel's. Unlike plastic, aluminum almost always saves weight when it replaces a steel hang-on part that doesn't have key structural responsibility.

"Plastic and aluminum are supposed to be lighter than steel," says Mr. Kalush of Pontiac. "But if they have much structural responsibility, they have to be beefed up so much that sometimes you don't save much weight."

Aluminum was most popular as an exterior body panel in the mid-1970's, when Detroit hustled to meet the corporate average fuel economies (CAFE) mandated by Washington. Without major adjustments to tooling, automakers could substitute aluminum for steel and save weight significantly.

Rushing to save weight, automakers sometimes didn't adjust their tooling to take into account the differences between aluminum and steel. The springback of the two metals is different. The formability of aluminum is poorer than the deep-draw automotive steels. Aluminum's formability, however, is more comparable to the new high-strength low-alloy (HSLA) steels.

"The first one or two stages of the tooling sequence," says Mr. Wheeler of Alcan, "have to be designed specifically for aluminum. That means significant

extra dollars.

"But once those unique tools give you the basic shape for, say, a hood, the next five or six tools can be the same for both steel and aluminum. Steel and aluminum also can go down the same paint line."

"Since aluminum has a lower modulus than steel," says Joseph H. King, manager, metallurgical engineering, Chrysler, "the draw dies must be designed with more overcrown. Otherwise you'll bend the aluminum more without forming it.

"Also, aluminum is softer and scratches more easily than steel. So you have to tailor your handling equipment for aluminum; and make sure the aluminum doesn't rub against steel rollers, for example."

Most automakers who used aluminum sheet to make CAFE requirements soon switched back to steel. Even when they learned how to tool for aluminum, they didn't want to pay the higher price of aluminum.

"An engineer can be a hero twice," says Mr. Riffe of U.S. Steel. "In the mid-70s his boss told him to take X number of pounds out of the vehicle immediately. The quickest way to do that was to substitute aluminum or plastic for steel. He's a hero.

"But the cost of the component has increased. Now his boss tells him to take X number of dollars out of the vehicle. So he comes up with a steel design that adds very little if any weight but definitely saves dollars. He's a hero again.

"Why didn't he go to steel in the first place? He didn't have time to redesign the familiar material."

Today, aluminum is used for very few major body panels. In recent years, Ford's Lincoln Continental and Versailles have used aluminum hoods but then gone back to steel. Oldsmobile ran both aluminum and steel hoods down essentially the same manufacturing line for use in some diesel and California models. Chrysler used aluminum panels on its Feather Duster but has used no major aluminum panels in the past several years.

"Aluminum simply isn't cost-effective as a skin material," says Mr. Harwood of Ford. "We typically consider it for heavier luxury cars. That's about the only place you can afford to use it."

"We use aluminum on a need-for basis," says Ronald S. Michalak, chief engineer, paint and corrosion resistance, Fisher Body. "I'm aware of only one or two current applications on GM bodies. We sometimes use it for the tulip panel, the small filler panel between the backlight and the decklid."

"We use aluminum on the car skin," says Mr. King of Chrysler, "exclusively for trim. For trim we like it better than stainless steel because of its corrosion characteristics.

"Since all our plants are geared up to produce steel, we'd find it very very difficult to produce one aluminum part in the plant. I don't think we'd produce an aluminum body panel internally. More likely we'd buy it from an outside source."

Aluminum doesn't spot-weld as consistently as mild steel, though it's comparable to galvanized steel. Except by exotic techniques, aluminum can't be welded directly to steel; it must be bolted on. Midland Ross is exploring ways to improve the weldability of aluminum and the tip life of equipment used to weld aluminum.

Electrogalvanized steel offers the best corrosion protection.

Truck cabs are a significant market for aluminum. Most of the major truck companies use aluminum for the major body panels of some truck-cab lines.

In passenger cars, the major market for aluminum is not sheet but structural castings and forgings. Of the 125 to 155 lbs of aluminum used in the average car in 1985, predicts Mr. Harwood of Ford, 100 to 110 lbs will be used for castings. The 1984 Corvette uses 375 lbs of aluminum, mainly castings and forgings.

"The high cost of tooling for aluminum and all metal panels is a major problem," says Mr. Wheeler of Alcan. "We need ways to make metal parts in lower volumes. Perhaps you could adapt Kirksite or some similar material to make lower-cost, lower-volume tooling that depended more on maintenance."

"The economies of scale," says Mr. Michalak of Fisher Body, "still favor steel. Our history, our knowledge, our tooling experience show that we're best prepared to continue producing steel vehicles for quite some time."

"Everybody wants a piece of our act," says Mr. Connor of Inland. "Had we stood still, our competitors would have succeeded. But we've made two important thrusts: We've improved the formability of our steels, and we've developed new coatings.

"We have lighter gage steels that resist corrosion better. Not only have automakers been taking weight out of the car; they've also been building them to last longer."

"Steel will lose some ground to the other materials in the next ten years," says Mr. King of Chrysler. "But I expect no significant shift during the next five years."

The two main challenges for the steel and auto industries have been to reduce weight and to increase corrosion resistance.

In the past several years, General Motors and Ford have reduced steel corrosion mainly by installing cathodic electrocoat paint systems in all their assembly paints.

"We're continually upgrading our corrosion protection," says Dennis M. McCarthy, supervisor, materials development, advanced vehicle engineering and technology, Ford. "Besides the cathodic electrocoat paint systems, we've run a clean-steel program; used zinc-rich primer materials on sheet metals; and applied sealer and waxes in the assembly plant.

"We've also used one- and two-side galvanized steel, and we expect to use more."

The consensus emerging among steel and automakers is that of the different steels electrogalvanized steel offers the best corrosion protection. Second best is hot-dipped galvanized; then Zincrometal; then painted steels; then bare steel.

"Electrogalvanized steel appears to offer the best corrosion protection of any steel," says Mr. Michalak of Fisher Body. "An electrogalvanizing facility is very important; it's needed for the auto industry to be totally satisfied."

American steelmakers presently have only two electrogalvanizing lines that produce automotive steels. U.S. Steel's Gary Works makes one-sided G90 galvanized. Sharon Steel's electrogalvanized line makes limited widths.

Japan has more electrogalvanized capacity. That could become a significant advantage for Japanese automakers.

National and Inland are among the American steelmakers who say they're seriously studying installation of an electrogalvanizing line. That might cost $100 million for an annual capacity of half a million tons.

"For a long period of time," says Mr. Michalak, "there's been just a lot of talk about electrogalvanizing.

"If the investment is too much for any one steel supplier to make, perhaps someone in the steel-handling world could build the facility. The electrogalvanizing could be done on a contractual basis, the way Zincrometal is done through a toll-coater."

"Electrogalvanizing," says David W. Gomersall, manager, product and process support, National Steel, "offers a lot more flexibility than hot-dipped in both the steel substrates and coatings you can use. Electrogalvanizing is a cold process in which the substrate is coated with zinc but otherwise not affected by

the process.

"Hot dip, on the other hand, is a thermal process in which the substrate is thermomechanically affected by the process.

"Also, the coating weight in hot-dip is controlled by air pressure. That's much harder to control than in electrogalvanizing."

"The distinct advantage of electrogalvanizing," says Mr. Michalak of Fisher Body, "is the ease of producing a consistent product day in and day out."

"Electrogalvanized has a more uniform deposition," says Mr. McCarthy of Ford, "so you need slightly less coating to get the same amount of protection as with hot-dipped."

"The thinner coating of electrogalvanized," says Mr. Gomersall of National, "improves its weldability. Also, you can tailor the electrogalvanized product's alloy or zinc coating to the paint system."

Since electrogalvanizing is a cold, or ambient-temperature, process, it can be used with continuous annealing lines (CAL). When Inland and Bethlehem start up their new CALs this fall, it's uncertain how the steel will be coated. Hot-dip coating the steel would undo the chemistries of the CAL cold-rolling.

In the next five years, automakers will continue to order more galvanized steels and fewer Zincrometals. By 1990, predicts National, zinc-coated steels will account for more than half the flat-rolled steels ordered by the auto industry.

Still unclear, however, is how much of what types of galvanized steels the automakers will buy.

"There is such a tremendous number of products available," says Mr. McCarthy of Ford. "We're still evaluating them all but haven't made final decisions.

"Currently we're using two-side galvanized. We'll continue using two-sided but we're looking at 1½-side galvanized, too. There will be growing applications of 1½-side galvanized."

Fisher Body is the largest single buyer of steel in the U.S.: 2 million tons per year. That includes 600,000 tons of galvanized steels; 520,000 tons of Zincrometal; and 134,000 tons of high-strength.

Fisher Body uses a heavy cathodic priming system that's not compatible with 1½-side galvanized.

Chrysler doesn't have that priming system. Of the Big 3, it has the most definite plans for steel use:

"We plan to use 1½-side galvanized exclusively," says Mr. King of Chrysler.

"We also would be very pleased if the domestic steel industry would develop an electrogalvanized equivalent to 1½-side.

"In 1983 we are using large amounts of one-side electrogalvanized steel. Our ultimate goal is 1½-side electrogalvanized."

One and one-half galvanized steel has an iron/zinc alloy on the exterior surface and free zinc on the interior. The iron/zinc side is much more weldable and has a smoother surface than the free-zinc side.

The free zinc provides strong galvanic protection against corrosion from the inside out. The free zinc sacrifices itself and forms white

When something chips the iron-zinc alloy on the exterior panel, says Mr. King, "our tests show that nothing happens. There is no red rust and no white rust. After five years according to our accelerated test, all you can see at the bottom of the crack is brown. There's no running rust."

The auto industry's goal is to guarantee ten years of no rust from the inside out (perforations); and five years of no rusting due to chips from stones, for example (cosmetic corrosion).

"In my judgement," says Mr. King, "a car can be free of perforations for ten years if you use all heavy-gage galvanized steel with both a heavy coating and a G-90 side."

Galvanizing cold-rolled steel adds not only corrosion resistance but also manufacturing challenges and some cost: Galvanized steel costs about 6¢ per lb more than cold-rolled steel, says Mr. King of Chrysler.

"The more coating you add to the steel surface," says Mr. McCarthy of Ford, "the poorer the paintability, weldability, and formability."

Most steelmakers are upgrading their hot-dip galvanizing lines. "We're getting to the point," says Peter B. Lake, marketing manager, product development, National Steel Group, "where we can produce a hot-dip product that's close to matching the performance of cold-rolled."

The weight of steel has remained surprisingly competitive with that of aluminum and steel. Steelmakers not only are improving their high-strength steels but also are learning how to tool thinner-gage mild steel.

"There is a place on the car for aluminum, for plastic, and for steel," says Mr. Riffe of U. S. Steel. "I'm going to fight to keep my place. I'll develop new materials, new techniques, whatever I need to fight." □

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EFFECTIVE AUGUST 22, 1983

MATERIALS NEWSFRONT

Price & Production Data

Steel production by districts, thousands of tons (000 omitted)

	Last Week	Two Weeks Ago	Month Ago	Year Ago
North East Coast	168	159	171	118
Buffalo	27	31	30	4
Pittsburgh	220	204	194	145
Youngstown	95	90	96	74
Cleveland	136	128	114	103
Detroit	113	141	132	116
Chicago	412	453	459	321
Cincinnati	83	83	95	81
St. Louis	75	74	69	44
Southern	134	139	125	110
Western	83	88	87	77
U.S. Production	1,546	1,590	1,572	1,193

Source: American Iron & Steel Institute

Lake Superior Ore Prices

51.50% Fe Natural delivered lower Lake ports. Rail transportation, handling and unloading may be charged to the account of the buyer. Coarse ore 80¢ premium.

Pellets (per iron unit natural)..... gross-ton 80.50-86.9*
Old range, non-bessemer ..... gross-ton $32.78
Mesabi, regular-unscreened ..... gross-ton $32.53
Mesabi, non-bessemer.....gross-ton $32.25-32.53**

*80.50¢—Pickands Mather as of 1/27/81.
**86.9¢—U. S. Steel as of 3/15/82. Cleveland-Cliffs as of 2/26/82, Oglebay Norton as of 3/25/82, and Hanna Mining as of 2/26/82.

Steel Production, Composite Prices

(Effective August 22, 1983)

U.S. Steel Production	Last Week	Two Weeks Ago	To Date 1983	To Date 1982
Net tons, in thousands	1,546	1,590	51,519	50,213
Capability Utilization Rate	53.7	55.2	53.8	51.3

Composite Prices	This Week	Week Ago	Month Ago	Year Ago
Finished Steel Base* (¢/lb.—eff. 2/14/83)	26.217	26.217	26.217	25.297
Pig Iron* * (Net ton=2000 lbs.)	$213.00	$213.00	$213.00	$213.00
Scrap No. 1 hvy.* * * (Gross ton=2240 lbs.)	$ 75.17	$ 75.17	$ 72.50	$ 55.83
No. 2 bundles	$ 45.50	$ 45.50	$ 45.50	$ 41.83
Scrap Comparison (Gross Ton)				
No. 1 steel, Pittsburgh	$ 79.50	$ 79.50	$ 74.50	$ 57.50
No. 1 steel, Philadelphia	68.50	68.50	68.50	59.50
No. 1 steel, Chicago	77.50	77.50	74.50	50.50
No. 1 bundles, Detroit	71.50	71.50	71.50	56.50
Low Phos., Youngstown	79.50	79.50	77.50	63.50
No. 1 mach'y cast., Pgh	74.50	74.50	74.50	71.50
No. 1 mach'y cast., Phila	95.50	95.50	95.50	100.50
No. 1 mach'y cast., Chi	109.50	108.50	108.50	102.50

*Finished Steel Composite
Weighted index of steel bars, shapes, plates, wire, rails, black pipe, hot and cold rolled sheets and strips.
* *Pig Iron Composite
Based on average prices for basic and foundry pig iron at representative producing points within the U.S.
* * *Steel Scrap Composite
Average of No. 1 hvy. melting steel scrap and No. 2 bundles delivered to consumers at Pittsburgh, Philadelphia and Chicago.

Nonferrous Prices

(Effective August 22, 1983)
Prices obtained in trade based on representative tonnages per gross ton delivered to consumer unless otherwise stated.

Primary Metal Prices

(cents per lb.)	current price	last price	date of change
Aluminum	76.00 (Nom.)	76.00-80.00	1/4/82
Copper (C)	77.00-78.00	77.00-79.00	8/19/83
Lead	19.00-23.00	20.00-23.00	8/10/83
Magnesium Ingot	138.00	134.00-138.00	6/1/83
Nickel	329.00	350.00	11/25/81
Titanium Sponge	555.00-585.00	555.00	4/29/82
Zinc	43.00	40.00-43.00	7/25/83

ALUMINUM: 99.5%. COPPER (C) = cathode. LEAD: common grade. MAGNESIUM: 99.8% pig, delivered. NICKEL: electro., Port Colborne, Canada. ZINC: high grade.

Antimony, American Laredo, Texas . $2.00
Beryllium-aluminum 5% Be, per lb. contained Be $215.00
Beryllium-copper, per lb. cont. Be $130.00
Beryllium 97% powder 200 ..... $178.00
Bismuth, ton lots ..... $1.65-$1.75
Cadmium, under one ton ..... $1.05-$1.15
Calcium, ton lots, crown $3.05
Chromium, 99.8% $3.75
Cobalt, 99%, cathode $12.50
Gold per troy oz. $421.75
Indium, dollars per troy oz. $3.50
Iridium, dollars per troy oz. $600
Magnesium sticks, 10,000 lbs. $1.91
Mercury, per 76-lb. f.o.b. N.Y. ..$275-$280
Molybdenum, lb. tech. moly oxides, 20 lb. MO can $5.85
Nickel oxide sinter at U.S. points of entry $3.12
Palladium, per troy oz. $140
Platinum, per troy oz. $475
Rhodium, per troy oz. $600.00
Silver ingots, per troy oz. $12.20
Vanadium $4.94
Zirconium sponge..... $12.00-$17.00
(Per lb. unless otherwise noted)

Straits Tin Price

(U.S. cents per lb, EX-SMELTER, based on daily market in Penang in Malaysian dollars per kilo.)

August 15—581.62 August 18—584.70
August 16—579.67 August 19—584.54
August 17—584.57

Scrap Prices

Brass Mill Scrap

(Cents per lb; over 20,000 lbs. add 1¢ per lb)

	Solids	Turning
Copper	74⅛	68¼
Yellow brass	63⅜	60¾
Red brass	68⅛	64½
Comm. bronze	69⅞	65¾
Mang. bronze	64⅛	61¾
Free cutting rod ends	59	58

Custom Smelters Scrap

(Cents per lb., carload lots, del. refinery)

No. 1 copper wire	68
No. 2 copper wire	60
Light copper	51

Ingot Makers Scrap

(Cents per lb., carload lots, del. refinery)

No. 1 copper wire	64
No. 2 copper wire	56
Light copper	47
No. 1 composition	57
No. 1 comp. turnings	55
Hvy. yellow brass solids	36
Hvy. yellow brass turnings	29
Radiators	47

Aluminum

New mixed clips	47	—48
Old sheet	46	—47
Old cast	46	—47
Clean dry borings	46	—47

Dealers' Scrap

(Dealers' buying price f.o.b. New York in cents per pound)

Aluminum

Segregated clippings	40	—41
Mixed L.C. clips	34	—35
Old sheets and cast	33	—34
Borings and turnings	23	—24
Duraluminum clippings	29	—30

Copper and Brass

No. 1 copper wire	60	—61
No. 2 copper wire	53	—54
Light copper	47	—48
Radiators	37	—38
No. 1 composition	48	—49
No. 1 composition turn'gs	45	—46
Cocks and faucets	34	—35
Clean heavy yellow brass	31	—32
Brass Pipe	33	—34
New soft brass clippings	47	—48

Lead

Heavy soft lead	8	— 9
Whole batteries	3	— 4
Type metal	15	—16
Electrotype	13	—14

Nickel

Nickel solids	110	—120
Nickel rod ends	110	—120
Nickel sheets, clips	110	—120
Nickel turnings	50	— 60

Zinc

New zinc clippings	15	—16
Old diecast zinc	9	—10

EFFECTIVE AUGUST 22, 1983

MATERIALS NEWSFRONT

(Effective August 22, 1983) Prices obtained in trade based on representative tonnages per gross ton delivered to consumer unless otherwise stated. Prices are the opinions of *Iron Age* editors and correspondents, based on contacts with dealers, brokers, generators and users in the industry on the effective date listed above.

Ferrous Scrap Prices

Pittsburgh

No. 1 hvy. melting	$ 79.00 to	$ 80.00
No. 2 hvy. melting	69.00 to	70.00
No. 1 dealer bundles	94.00 to	95.00
No. 1 factory bundles (auto)	92.00 to	93.00
No. 2 bundles	51.00 to	52.00
No. 1 busheling	92.00 to	93.00
Machine shop turn.	7.00 to	8.00
Shoveling turnings	26.00 to	27.00
Cast iron borings	25.00 to	26.00
Low phos. punchings plate	94.00 to	95.00
Heavy turnings	69.00 to	70.00
No. 1 RR hvy. melting	88.00 to	89.00
Rails 2 ft. and under	102.00 to	103.00
Scrap rails, random lgth.	90.00 to	91.00
RR specialties	98.00 to	99.00
No. 1 machinery cast	74.00 to	75.00
Cupola cast	67.00 to	68.00
Heavy breakable cast	30.00 to	31.00
Stainless		
18-8 bundles and solids	600.00 to	610.00
18-8 turnings	500.00 to	510.00

Chicago

No. 1 hvy. melting	$ 77.00 to	$ 78.00
No. 2 hvy. melting	72.00 to	73.00
No. 1 dealer bundles	99.00 to	100.00
No. 1 factory bundles (auto)	93.00 to	94.00
No. 2 dealer bundles	44.00 to	45.00
No. 1 busheling	91.00 to	92.00
Shredder scrap	84.00 to	85.00
Machine shop turn.	23.00 to	24.00
Mixed bor. and turn.	24.00 to	25.00
Shoveling turnings	31.00 to	32.00
Cast iron borings	44.00 to	45.00
Low phos. forge crop	96.00 to	97.00
Low phos. punchings plate ¼ in. and heavier	107.00 to	108.00
Low phos. 2 ft. and under	102.00 to	103.00
No. 1 RR hvy. melting	87.00 to	88.00
Scrap rails, random lgth.	81.00 to	82.00
Reroller rails	95.00 to	96.00
Rails, 2 ft. and under	99.00 to	100.00
RR couplers and knuckles	87.00 to	88.00
RR car axles	114.00 to	115.00
No. 1 machinery cast	109.00 to	110.00
Cupola cast	97.00 to	98.00
Stove plate	92.00 to	93.00
Steel car wheels	96.00 to	97.00
Stainless		
18-8 bundles and solids	570.00 to	580.00
18-8 turnings	470.00 to	480.00
430 bundles and solids	135.00 to	140.00
430 turnings	100.00 to	105.00

Philadelphia

No. 1 hvy. melting	$ 67.00 to	$ 70.00
No. 2 hvy. melting	54.00 to	57.00
No. 1 dealer bundles	78.00 to	81.00
No. 2 dealer bundles	39.00 to	42.00
No. 1 busheling	78.00 to	81.00
Shredder scrap	80.00 to	83.00
Machine shop turn.	23.00 to	26.00
Mixed bor. and turn.	23.00 to	26.00
Shoveling turnings	41.00 to	44.00
Low phos. 5 ft. and under	77.00 to	80.00
Low phos. 2 ft. punchings	90.00 to	93.00
Electric furnace bundles	93.00 to	96.00
RR specialties	81.00 to	84.00
Rails, 2 ft. and under	92.00 to	95.00
Cupola cast	58.00 to	61.00
Heavy breakable cast	53.00 to	56.00
No. 1 machinery cast	94.00 to	97.00

Detroit

Broker buying prices per gross ton on cars:

No. 1 hvy. melting	$ 55.00 to	$ 56.00
No. 2 hvy. melting	53.00 to	54.00
No. 1 dealer bundles	71.00 to	72.00
No. 2 bundles	36.00 to	37.00
No. 1 busheling	69.00 to	70.00
Drop forge flashings	45.00 to	46.00
Machine shop turn.	27.00 to	28.00
Mixed borings and turn.	16.00 to	17.00
Shoveling turnings	27.00 to	28.00
Cast iron borings	15.00 to	16.00
Heavy breakable cast	34.00 to	35.00
Mixed cupola cast	50.00 to	51.00
Automobile cast	73.00 to	74.00
Stainless		
18-8 bundles and solids	470.00 to	480.00
18-8 turnings	350.00 to	360.00
430 bundles and solids	115.00 to	125.00

Youngstown

No. 1 hvy. melting	$ 67.00 to	$ 70.00
No. 2 hvy. melting	39.00 to	42.00
No. 1 dealer bundles	85.00 to	88.00
No. 2 dealer bundles	37.00 to	40.00
Machine shop turn.	1.00 to	3.00
Shoveling turnings	5.00 to	8.00
Low phos. plate	79.00 to	80.00
Electric furnace bundles	74.00 to	77.00
Galvanized bundles	66.00 to	69.00

Cleveland

No. 1 hvy. melting	$ 60.00 to	$ 63.00
No. 2 hvy. melting	32.00 to	35.00
No. 1 dealer bundles	85.00 to	88.00
No. 1 factory bundles	87.00 to	90.00
No. 2 bundles	22.00 to	25.00
No. 1 busheling	84.00 to	87.00
Machine shop turn.	1.00 to	4.00
Mixed bor. and turn.	1.00 to	4.00
Shoveling turnings	3.00 to	6.00
Cast iron borings	6.00 to	9.00
Cut structural & plates, 2 ft. and under	99.00 to	102.00
Low phos. punchings plate	99.00 to	102.00
Drop forge flashings	37.00 to	40.00
Foundry steel, 2 ft. & under	57.00 to	60.00
No. 1 RR hvy melting	77.00 to	80.00
Rails, 2 ft. and under	102.00 to	105.00
Rails, 18 in. and under	103.00 to	106.00
Steel axle turnings	67.00 to	70.00
Railroad cast	80.00 to	83.00
No. 1 machinery cast	87.00 to	90.00
Cupola cast	60.00 to	63.00
Stove plate	45.00 to	48.00
Stainless		
18-8 bundles	325.00 to	335.00
18-8 turnings	275.00 to	285.00
430 bundles	80.00 to	85.00

Buffalo

Broker buying prices per gross ton on cars:

No. 1 hvy. melting	$ 55.00 to	$ 56.00
No. 2 hvy. melting	44.00 to	45.00
No. 1 busheling	74.00 to	75.00
No. 1 dealer bundles	73.00 to	74.00
No. 2 bundles	30.00 to	31.00
Machine shop turn.	12.00 to	13.00
Mixed bor. and turn.	13.00 to	14.00
Shoveling turnings	17.00 to	18.00
Cast iron borings	12.00 to	13.00
Low phos. plate	74.00 to	75.00
Structural and plate, 2 ft. and under	70.00 to	71.00
Rails, 2 ft. and under	82.00 to	83.00
Scrap rails, random lgth.	65.00 to	66.00
No. 1 machinery cast	67.00 to	68.00
No. 1 cupola cast	48.00 to	49.00

St. Louis

No. 1 hvy. melting	$ 66.00 to	$ 67.00
No. 2 hvy. melting	55.00 to	56.00
Foundry steel, 2 ft.	54.00 to	55.00
No. 1 dealer bundles	66.00 to	67.00
No. 2 bundles	52.00 to	53.00
Machine shop turn.	15.00 to	16.00
Shoveling turnings	22.00 to	23.00
Cast iron borings	33.00 to	34.00
No. 1 RR hvy. melting	77.00 to	78.00
Rails, random length	74.00 to	75.00
Rails, 18 in. and under	90.00 to	91.00
RR specialties	83.00 to	84.00
Cupola cast	70.00 to	71.00
Heavy breakable cast	48.00 to	49.00
Stove plate	75.00 to	76.00
Cast iron car wheels	49.00 to	50.00
Rerolling rails	97.00 to	98.00
Unstripped motor blocks	57.00 to	58.00

Birmingham

No. 1 heavy melting	$ 70.00 to	$ 71.00
No. 2 heavy melting	64.00 to	65.00
No. 1 dealer bundles	71.00 to	72.00
No. 2 bundles	45.00 to	46.00
No. 1 busheling	71.00 to	72.00
Shredder scrap	84.00 to	85.00
Machine shop. turn.	24.00 to	25.00
Shoveling turnings	32.00 to	33.00
Cast iron borings	33.00 to	34.00
Electric furnace bundles	67.00 to	68.00
Elec. furnace, 3 ft. & under	64.00 to	65.00
Structural and plate, 2 ft.	91.00 to	92.00
Structural and plate, 4 ft.	85.00 to	86.00
No. 1 RR hvy. melting	71.00 to	72.00
Scrap rails, random lgth.	80.00 to	81.00
Rails, 18 in. and under	90.00 to	91.00
Angles and splice bars	85.00 to	86.00
No. 1 cupola cast	84.00 to	85.00
Unstripped motor blocks	64.00 to	65.00

Cincinnati

Brokers buying prices per gross ton on cars:

No. 1 hvy. melting	$ 60.00 to	$ 61.00
No. 2 hvy. melting	57.00 to	58.00
No. 1 dealer bundles	68.00 to	69.00
No. 2 bundles	30.00 to	31.00
Machine shop turn.	7.00 to	8.00
Shoveling turnings	10.00 to	11.00
Cast iron borings	14.00 to	15.00
Low phos. 18 in. and under	85.00 to	86.00
Rails, random length	70.00 to	71.00
Rails, 2 ft. and under	88.00 to	89.00
No. 1 cupola cast	67.00 to	68.00
Heavy breakable cast	34.00 to	35.00
Drop broken cast	80.00 to	81.00

New York

Brokers buying prices per gross ton on cars:

No. 1 hvy. melting	$ 34.00 to	$ 35.00
No. 2 hvy. melting	30.00 to	32.00
No. 2 dealer bundles	22.00 to	23.00
Mixed bor. and turn.	7.00 to	8.00
Machine shop turn.	4.00 to	5.00
Shoveling turnings	10.00 to	12.00
Clean cast. chem. borings	34.00 to	35.00
No. 1 machinery cast	89.00 to	90.00
Mixed yard cast	38.00 to	39.00
Heavy breakable cast	14.00 to	15.00
Stainless		
18-8 prepared solids	490.00 to	510.00
18-8 turnings	390.00 to	410.00
430 prepared solids	70.00 to	80.00
410 solids	60.00 to	70.00

Boston

Brokers buying prices per gross ton on cars:

No. 1 hvy. melting	$ 38.00 to	$ 40.00
No. 2 hvy. melting	28.00 to	30.00
No. 1 dealer bundles	44.00 to	46.00
No. 2 bundles	29.00 to	31.00
No. 1 busheling	44.00 to	46.00
Shredder scrap	43.00 to	45.00
Machine shop turn.	3.00 to	5.00
Shoveling turnings	7.00 to	9.00
No. 1 machinery cast	100.00 to	105.00
Mixed cupola cast	28.00 to	30.00
Heavy breakable cast	8.00 to	10.00

San Francisco

No. 1 hvy. melting	$ 42.00 to	$ 44.00
No. 2 hvy. melting	34.00 to	36.00
No. 1 dealer bundles	29.00 to	31.00
No. 2 dealer bundles	13.00 to	15.00
Machine shop turn.	6.00 to	8.00
Cast iron borings	6.00 to	8.00
No. 1 cupola cast	85.00 to	87.00

Los Angeles

No. 1 hvy. melting	$ 40.00 to	$ 42.00
No. 2 hvy. melting	29.00 to	31.00
No. 1 dealer bundles	27.00 to	29.00
No. 2 dealer bundles	10.00 to	12.00
Machine shop turn.	6.00 to	8.00
Shoveling turnings	10.00 to	12.00
Cast iron borings	6.00 to	8.00
Elec. furnace, 1 ft. and under (foundry)	85.00 to	87.00
No. 1 cupola cast	87.00 to	89.00

Seattle

No. 1 hvy. melting	$ 59.00 to	$ 61.00
No. 2 hvy. melting	48.00 to	50.00
No. 2 bundles	38.00 to	40.00
No. 1 cupola cast	94.00 to	96.00
Mixed yard cast	81.00 to	83.00

Hamilton, Ont.

Brokers buying price per net ton on cars:

No. 1 heavy melting	$ 55.00
No. 2 heavy melting cut 2 ft. and under	52.00
No. 1 dealer bundles	60.00
No. 2 bundles	30.00
Mixed steel scrap	34.00
Bush. new fact. prep'd.	58.00
Bush. new fact. unprp'd.	50.00
Machine shop turn.	25.00
Short steel turn.	28.00
Mixed bor. and turn.	15.00
Cast scrap	48.00

Houston

Brokers buying prices per gross ton on cars:

No. 1 hvy. melting	$ 71.00 to	$ 72.00
No. 2 hvy. melting	53.00 to	55.00
No. 2 bundles	34.00 to	35.00
Machine shop turn.	19.00 to	20.00
Crushed turnings	36.00 to	38.00
Shredder scrap	71.00 to	72.00
Cut structural plate 2 ft. and under	86.00 to	89.00
Unstripped motor blocks	57.00 to	59.00
Cupola cast	73.00 to	75.00

STEEL PRICES

Codes identify Producers listed in the Key on page 106. (Prices quoted are mill base prices in cents per pound unless otherwise noted and do not reflect extras or surcharges.) N.A.—Not available.

Billets, Blooms, Slabs

(Dollars per net ton)

Carbon Rerolling, Midwest	
W5	$366.00
N4	$366.00
West	
C6	$346.00
Carbon Forging, East	
B3(3), C10, U1	$453.00
R3	$453.00
Midwest	
R3, U1, W5	$453.00
S1	$420.00
C10	$453.00
K2	$453.00
W5	$453.00
West	
B3(2)	$463.00
C6	$453.00
South	
A7	$453.00
Alloy, East	
R3, C10	$492.00
B3	$492.00
Midwest	
W8, W5, C10	$492.00
U1	$492.00
R3	$492.00
S1	$459.00
West	
B3	$502.00
C6	$469.00
South	
A7	$492.00

Piling Sheet Steel

(cents per lb)

Midwest	
U1	26.45

Structurals

Carbon, East	
B3(2)	23.90
U1, J3	23.90
Midwest	
A7	24.15
C20	22.90
W8	22.90
I3, T10, U1, N4	23.90
West	
C6	25.10
U1	24.40
B3(2)	21.65
South	
C16, U1	23.90
T10	22.90
A8	Cmp*
High-Strength, Low Alloy, East	
B3(2)	23.90
U1, J3	23.90
Midwest	
N4	23.90
W8	24.15
U1	23.90
I3	23.90
West	
U1, A7	24.40
B3(2)	21.65
South	
U1, C16	23.90
Wide Flange, Carbon, East	
B3	23.90
U1, A7, J3	23.90
Midwest	
U1	23.90
N4	23.90
I3	23.90
West	
U1	24.40
C6	24.15
South	
A7	24.15

Strip

Hot-Rolled, Carbon, Cut ll Edge—all widths, East	
B3, U1	22.05
J3	22.05
Midwest	
A7, D1	22.05
I4	21.45
S1, J3, D1	22.05
W3	22.05
N4	22.55
W5	22.05
U1	22.05
B3, G2, I3, M2, R3, G3	22.05
West	
K1	20.80
B3	26.55
South	
R3	22.05
Cold-Rolled, Carbon Max. 25%, East	
E4	29.75
R7, S10	29.60
P15	24.80
S7	Cmp*
U1	35.30
D1(1)	Cmp*
B4	33.60
Midwest	
G4	24.80
I4	35.30
W14	22.95
S1, J4	34.05
T4	Cmp*
*Composite pricing	
West	
U1	33.25
High-Strength, Hot-Rolled, Low Alloy, Cut Edge & Mill Edge—all widths, (plus extras)†	
Midwest	
M2, G3, R3, W3, I4, J3, G2, I3	22.05
A7	22.05
S1	22.05
West	
K1	22.05
South	
R3	22.05
High-Strength, Cold-Rolled, Low Alloy, Mill Edge, East	
R7	29.00
Midwest	
S1	32.00
Alloy, Hot-Rolled, Midwest (plus extras)*	
S1	24.60
G4	25.80
I4	23.70
Alloy, Cold-Rolled, East	
C11, E4, M8	43.35
R7	32.75
B4	42.60
P15	32.10
Midwest	
I4	41.80
S1	42.30

Sheets

Hot-Rolled, Carbon (18 Ga & Hvyr), East	
B3	22.05
J3	22.05
U1	22.05
Midwest	
A7, U1, B3, G2, G3, I3, M2, R3, W3	22.05
S1, W5, D1	22.05
J3	22.05
I4	21.15
West	
U1	21.30
K1	22.05
South	
R3	22.05
Cold-Rolled, East, Class I	
B3(2), U1	26.15
J3	26.15
Midwest	
B3, I3, G3, R3, M2, U1(2)	26.15
G2, W3, M11	26.15
I4	22.00
J3, A7	26.15
S1, W5, D1	26.15
West	
U1	26.65
South	
R3	24.65
Galvanized (hot-dipped), East	
B3(2), U1	28.00
Midwest	
J3, D1	28.00
I3, W5, S1	28.00
U1, A7, R3, Y1	28.00
G2, W3, M11	28.00
West	
K1	27.15
U1	28.50
South	
U1	28.00
R3	28.00
Enameling, Midwest	
A7, I3, U1, J3	27.65
S1	27.65
Long-Terms, Midwest	
W5	28.30
A7, U1	29.35
R3	29.35
†Actual weight basis	

Wire Rod

East	
B3(2)	22.35
U1	22.35
Midwest	
N4	22.35
U1, K2	22.35
West	
A7	22.00
C6	21.45
South	
G7	22.35

Tinplate

Electrolytic Tinplate

Single Reduced (70 lb)	
East	per base box
B3, J3	$26.29
U1	26.29
Midwest	
B3	$26.29
U1	26.29
J3	26.29
M11	26.29
W3	26.29
W5	26.29
West	
K1	$26.79
U1	26.79
South	
U1	$26.29
Double Reduced (55 lb)**	
Midwest	
M11	$21.49
B3, J3	21.49
U1	21.49
W3	21.49
W5	21.49
West	
K1	$21.99
U1	21.99
South	
U1	$21.49
Black Plate	
Single Reduced (75 lb)*	
East	
B3	$23.36
Midwest	
J3	$24.01
M11	24.01
I3, U1, W5	24.01
W3	24.01
West	
K1	$24.01
U1	23.36
Double Reduced (55 lb)	
East	
B3	$18.93
Midwest	
M11	$18.93
W5, U1	18.93
J3	18.93
W3	18.93
W5	18.93
West	
U1	$18.93
South	
U1	$18.93

*70 lb—base weight extra 45¢
**50 lb—base weight extra $1.40

Bars

Carbon Steel, Hot-Rolled (Special quality)	
East	
R3, K3	25.80
R5	25.80
B3(3), J3	25.80
U1, C10	25.80
Midwest	
A7	23.95
U1, I3, I4, C20, N4	25.80
R3, T10	25.80
K2	25.80
I3	19.50*
West	
B3	25.80
C6	24.45
South	
A8	20.65
A7	25.80
C16	25.80
Cold-Finished Carbon, East	
A11	22.15
R3	33.75
C21	21.15
J3(4), L2	31.00
C2	23.025
M8, W10, T11, S8	31.00
N1	24.475
R4	22.25
B4	31.00
M1	23.025
B4, C10	31.00
Midwest	
B5, W10, Y1, W8, R3, M9	33.25
J3	31.00
B1	19.80
L2	30.75
N9	31.00
P3	19.85+CMS
W14	22.20
J3(3)	31.00
J3	31.00
West	
B5	34.90
R3	37.15
South	
B5	32.85
J3	34.00
C16	24.40
J3	31.95
Alloy, Hot-Rolled, East	
B3(2), R5, K3, C10, U1	27.95
R3	27.95
J3	27.95
Midwest	
A7, U1, R3	27.95
I3, C10	27.95
I4	24.85
I3	21.00*
West	
B3	27.95
B5	18.50
C6	26.60
South	
A7	24.85
A8	22.00
Alloy, Cold Drawn, East	
L2	35.20
R3, N1, C2	37.90
M1	28.025
R4	25.85
A11	30.50
J3, W10, L2	34.85
T11, S8	34.85
C10	34.85
J3(2)	34.20
Midwest	
R3, C10	37.35
C2	28.275
J3, W10	34.85
P3	22.75
B1	22.70
N9	34.85
L2	34.65
B5	37.10
J3	36.00
J3	34.85
M9	37.10
West	
R3	40.75
South	
J3	35.85
C16	28.00

Plates

Carbon Steel, East	
B3(2), U1	25.75
L4	25.75
P2	25.75
J3	26.75
Midwest	
B3, R3, S1	25.75
I3	24.25
J3, A7	22.80
U1, I4	25.75
R3	26.75
West	
A7, C6, O2	24.25
K1	23.50
U1, B3	25.75
South	
R3	25.75
A7	25.75
U1	25.75
Alloy, East	
B3, J3	33.55
U1, L4	33.55
P2	33.55
J3	34.55
Midwest	
B3	33.55
G2, G3	33.55
I4, U1	33.55
West	
B3	32.05
O2	30.55
K1	31.30
South	
A7	27.55

Wire

Carbon Steel Wire, East	
B3(2)	27.10
U1	27.70
A11	22.15
Midwest	
U1	27.70
A7, R3	24.80
N4, W7	27.40
K2	24.20
South	
A8	22.85
West	
A7	25.95
C6	24.95

STEEL PRICES

Producer Key
With Principal Offices

A4 American Cladmetals Co., Carnegie, Pa.
A7 Armco Inc., Middletown, Ohio
A8 Atlantic Steel Co., Atlanta, Ga.
A11 Atlantic Wire Co., Branford, Conn.

B1 Baron Drawn Steel Corp., Toledo, Ohio
B3 Bethlehem Steel Corp., Bethlehem, Pa.
B4 Blair Strip Steel Co., New Castle, Pa.
B5 Bliss & Laughlin Steel Co., Harvey, Ill.

C1 Calstrip Corp., Los Angeles
C6 CF&I Steel Corp., Pueblo, Colo.
C10 Copperweld Steel Co., Warren, Ohio
C11 Crucible Divisions, Colt Industries, Pittsburgh, Pa.
C15 G. O. Carlson, Inc., Thorndale, Pa.
C16 Connors Steel Co., Birmingham, Ala.
C20 Calumet Steel Div., Chicago Heights, Ill.
C21 Cumberland Steel Co., Cumberland, Md.

D1 Detroit Strip Div., Cyclops Corp.
D2 Driver Wilbur B., Co., Newark, N. J.
D3 Driver Harris Co., Harrison, N. J.

E3 Enamel Products & Plating Co., McKeesport, Pa.
E4 Elliot Bros. Steel Co., New Castle, Pa.

F1 Firth Sterling, Inc., McKeesport, Pa.

G2 Granite City Steel Co., Granite City, Ill.
G3 Great Lakes Steel Division, National Steel Corp., Ecorse, Mich.
G4 Greer Steel Co., Dover, O.
G5 Green River Steel Corp., Owensboro, Ky.
G6 Gibraltar Steel Corp., Buffalo, N. Y.
G7 Georgetown Steel Corp., Georgetown, S. C.
G8 Guterl Special Steel Corp.

H1 Hercules Drawn Steel Corp., Livonia, Mich.

I2 Ingersoll Steel Div., New Castle, Ind.
I3 Inland Steel Co., Chicago, Ill.
I4 Interlake Steel Corp., Chicago

J2 Jessop Steel Corp., Washington, Pa.
J3 Jones & Laughlin Steel Corp., Pittsburgh
J4 Joslyn Mfg. & Supply Co., Chicago
J5 Judson Steel Corp., Emeryville, Calif.

K1 Kaiser Steel Corp., Fontana, Calif
K2 Keystone Consolidated Industries, Inc.
K3 Kentucky Electric Steel Co., Ashland, Kentucky
K5 Kemco Div., Foote Mineral Co., Keokuk, Iowa

L2 La Salle Steel Co., Chicago
L3 Lone Star Steel Co., Dallas
L4 Lukens Steel Co., Coatesville, Pa.
L5 Litho-Strip Corp., Chicago

M2 McLouth Steel Products Corp.
M4 Mid States Steel & Wire Co., Crawfordsville, Ind.
M8 Mill Strip Products Div., National Steel Service Center, National Steel Corp.
M9 Moltrup Steel Products Co., Beaver Falls, Pa.
M11 Midwest Steel Div., National Steel Corp., Portage, Ind.

N1 Northeast Precision Steel Co., Boston, Mass.
N4 Northwestern Steel & Wire Co., Sterling, Ill.
N8 Northwest Steel Rolling Mills, Seattle, Wash.
N9 Nelsen Steel & Wire Co., Chicago, Ill.
N10 North Star Steel Co., Saint Paul, Minnesota

O2 Oregon Steel Mills, Portland, Ore.

P2 Phoenix Steel Corp., Claymont, Del.
P3 Wyckoff Steel Div., Plymouth, Mich
P9 Pacific States Steel Co., Niles, Cal
P13 Penn Dixie Steel Corp., Kokomo, Ind.
P14 Pacific Tube Co., Los Angeles
P15 Philadelphia Steel and Wire Corp., Phila.

R3 Republic Steel Corp., Cleveland
R4 Ramco Steel Co., Buffalo, N. Y.
R5 Roblin Steel Corp., Inc., North Tonawanda, N. Y.
R6 Rodney Metals, Inc., New Bedford, Mass.
R7 Rome Strip Steel Co., Rome, N. Y.

S1 Sharon Steel Corp., Sharon, Pa.
S7 Stanley Works, New Britain, Conn.
S8 Superior Drawn Steel Co., Monaca, Pa.
S10 Seneca Steel Service, Buffalo, N. Y.
S16 Southern Precision Steel Co., Gulfport, Miss.

T4 Thomas Steel Strip Co., Warren, O.
T5 Timken Company, Steel Division, Canton, O.
T7 Texas Steel Co., Fort Worth, Tex.
T9 Triumph Electro Corp., Chicago, Ill.
T10 Tennessee Forging Steel Corp., Harriman, Tenn.
T11 Teledyne Columbia-Summerill, Carnegie, Pa.

U1 United States Steel Corp., Pittsburgh, Pa.

W3 Weirton Steel Division, National Steel Corp., Weirton, West Va.
W5 Wheeling-Pittsburgh Steel Corp.
W7 Wilson Steel & Wire Co., Chicago
W10 Wyckoff Steel Div., Ampco-Pittsburgh Corp., Pittsburgh, Pa.
W14 Whittaker Steel Strip Div., Detroit, Mich.

Steel Service Center Prices

Price, Dollars per 100 lb

Cities* / City Delivery Charge*	Sheets			Strip	Plates	Shapes	Bars		Alloy Bars			
	Hot-Rolled (10 gage)	Cold-Rolled (20 gage)	Galvanized (16 gage)	Hot-Rolled Strip	Plates	Standard Structurals	Hot-Rolled (merchant)	Cold Finished	Hot-Rolled 8620 As Rolled	Hot-Rolled 4140 Annealed	Cold-Drawn 8620 As Rolled	Cold-Drawn 4140 Annealed
Atlanta	21.79	29.06	30.99	29.47	20.27	24.13	17.51	30.17	42.10	52.60	69.58	73.19
Baltimore	28.67	28.19	35.29	37.30	24.85	28.64	19.19	36.85	55.85	59.91	69.79	76.32
Birmingham	21.49	29.10	30.69	29.55	20.89	24.20	17.31	29.88	49.31	68.90	68.16	74.43
Boston	25.11	29.68	34.62	45.11	35.11	37.52	20.95	41.20	48.40	52.69	62.29	67.33
Buffalo	28.09	34.26	38.88	42.37	33.04	28.77	17.80	41.10	39.03	48.82	56.33	64.06
Chicago	23.48	29.72	32.66	31.86	22.71	22.09	16.58	30.33	36.47	40.64	46.92	53.01
Cincinnati	23.39	28.64	31.57	32.00	23.70	23.49	16.46	30.51	35.04	39.58	43.36	49.78
Cleveland	26.14	31.77	33.83	34.38	26.55	29.66	15.69	29.89	34.02	39.96	44.20	50.99
Denver	33.10	40.58	37.46	41.88	34.45	35.59	21.42	41.66	51.78	59.12	67.62	70.99
Detroit	25.72	31.94	34.08	35.88	28.05	29.93	17.10	31.65	35.74	40.44	48.09	52.99
Houston	22.36	28.61	31.90	37.78	32.24	35.46	17.85	39.48	39.28	45.22	53.75	60.10
Kansas City	21.35	26.53	31.75	29.42	26.77	28.84	16.15	33.30	38.29	48.63	53.40	62.04
Los Angeles	25.20	31.50	36.22	36.87	33.73	35.10	27.82	40.90	50.17	58.10	63.65	73.22
Memphis	26.12	33.39	33.91	36.10	27.96	34.24	19.47	37.60	45.09	49.96	59.80	69.44
Milwaukee	23.58	29.65	30.87	32.01	23.77	26.33	15.92	32.06	35.95	41.55	45.68	52.45
New York	22.03	30.31	33.26	39.11	27.90	32.37	19.13	42.13	45.80	53.04	62.17	69.31
Philadelphia	28.39	35.11	36.92	46.98	30.88	35.97	19.70	39.64	46.41	52.66	62.06	69.23
Pittsburgh	26.55	32.66	35.16	41.38	32.45	29.51	20.41	41.30	48.51	54.05	61.11	68.88
Portland	25.66	33.27	38.17	31.11	31.04	34.76	27.50	44.85	49.78	57.74	70.44	....
San Francisco	25.76	32.84	36.85	41.13	32.49	33.46	28.78	48.02	57.14	66.13	76.05	84.10
Seattle	24.74	32.32	36.15	40.49	29.35	30.37	29.55	50.60	63.37	71.57	76.28	87.67
Spokane	21.00	30.34	34.28	37.91	33.00	33.75	21.80	43.01	43.20	47.52	....	58.32
St. Louis	24.07	30.42	32.35	33.03	26.14	27.28	16.48	32.42	34.06	39.65	47.02	53.40
St. Paul	24.39	27.90	31.48	32.42	26.33	28.12	15.45	32.93	34.26	39.60	44.90	52.20

Base Quantities. All HR products may be combined for quantity. Hot-rolled sheet, 10 ga x 36 x 96—120; Cold-rolled sheet, 20 ga x 36 x 120; Galv. sheet—16 ga x 36—120; Hot-rolled strip—¼" x 1"; Plate ¼" x 84/; Shapes—I-Beams 6 x 12.5; Hot-rolled bar—Rounds ¾-2^{15}/$_{16}$; Cold finished bar—C 1018—1" rounds; Alloy bar—Hot-rolled 8620—1⅝" round; Cold drawn—1" round; Hot-rolled 4140—1⅝" round; Cold drawn—1" round. Check local supplier for additions or deductions from base.

*Prices at all points include metropolitan delivery charges.